



Smarter Science Better Buildings Western Development Museum – North Battleford

Workstation Guiding Questions – Pages 1 - 6

Heating and Cooling

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. What factors make *cellulose insulation* an environmentally beneficial insulation choice?
2. *Heat Pumps* use electrical energy to move heat energy from one location to another. Compare the size of the blue “electrical energy coming in” arrow, to the size of the red “heat energy coming out” arrow. What does that tell you about the efficiency of the heating system?
3. Name three things *Beardy’s and Okemasis’ Cree Nation* wanted to accomplish with their new homes.
4. In *How Heat Moves*, which home would be warmer and less drafty in winter? Which home uses the least amount of energy?
5. Set the *thermostats* in the display to 15°C. If you set the thermostat in your home back to 15°C at night, how would it help you to save energy?





Net Zero Home

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. List the things that make up the *building envelope*. Why is it important for the envelope to be airtight and have good insulation?
2. *Canada's National Energy Code*: How much more energy efficient is tier 4 than the current Saskatchewan code? List three actions that would increase a home's energy efficiency.

1. _____

2. _____

3. _____

3. What is *thermal bridging* and how does the double wall construction reduce it?

4.

$$Q = \frac{A \times \Delta T}{R}$$

When you "turned down" the thermostat (ΔT), what happened to the power (Q), consumption of the house? Why?

5. What is the connection between the energy our homes use and *climate change*?





Lighting and Appliances

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. The **Innovative Design**: How does the reflective material bring natural light into the interior of the buildings?
2. The **average Saskatchewan home** uses a lot more electricity than the NET ZERO home. Name three ways the NET ZERO home uses less.
3. Look at the circle graph of **household electricity use**. Check (✓) ways you think you and your family could make changes to save electricity.

Use LED lights	Turn out lights that aren't needed	Dry clothes on a clothesline
Use timers for lights and vehicle block heaters	Use a power bar to turn off phantom load	Unplug electronics not in use
Buy ENERGY STAR® appliances	Reduce Air Conditioner use by setting the thermostat to 24°C or higher	Other:

4. Look at the **light display**. Excluding the exit lamp, which light uses the least amount of power?
5. **Energy = Power x Time**. If your lamp has two, 15watt bulbs, and you have them on for five hours, how much energy do they use?
 $Energy \text{ (watt hours)} = 2(15w) \times 5hrs$
 Explain how reducing power (w) and time (hrs) can reduce overall energy use?





Water

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. How does the **drain water heat recovery Powerpipe** use **conduction** to save energy? Look at the large copper pipe on the left side of the display.
2. Explain how a **rainwater system** described here makes use of rainwater.
3. What role do wetlands play in the **Logan Green Water Management System**?
4. Check (✓) ways you could **save water** in your home and at school.

Turn off the tap while brushing your teeth	Replace your old dishwasher with an ENERGY STAR® dishwasher	Take a shorter shower
Fix a leaking toilet	Turn off the tap after washing your hands	Install a low-flow showerhead
Collect rainwater to water your lawn/garden	Grow drought tolerant plants	Other:

5. **Shorter showers:** If a showerhead has a flow of 6 litres/minute, calculate the amount of water used for a five minute shower compared to a 20 minute shower.

$$6\text{L}/\text{min} \times 5\text{min} = \underline{\hspace{2cm}} \text{ L} \quad 6\text{L}/\text{min} \times 20\text{min} = \underline{\hspace{2cm}} \text{ L}$$

How much water do you save by shortening your shower this much?





Solar

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. What parts of Canada have the highest *annual photovoltaic potential*? What part of Saskatchewan has the highest potential?
2. Try the *solar panel* display. What difference do the clouds make to how bright the lights are? Why?
3. *Innovative designs:*
 - LightLeaf panels – where would you use these panels?
 - Mitrex building integrated panels – what makes these solar panels innovative?
4. The *Pesâkâstêw Solar Project* powers 2,500 homes and eliminates more than 15,000tCO₂e/year. List the benefits of this project for the two First Nations involved.
5. If your home uses 7,500 kWh/yr and the average solar panel produces 400 kWh/yr, how many panels will you need to produce enough electricity for your home? If you live in Saskatoon, check MyHEAT Solar to see the solar potential of your address.





Retrofits

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. Compare the **EnerGuide® ratings** of the historical and modern houses. What factors helped the older homes use less energy? What factors help the modern homes use less energy?
2. Put your hands on the **window display**. Which type of glass allows more heat to escape? Which window keeps more heat in? Explain how the window's design and construction contribute to heat loss or retention.
3. Try out the home retrofit samples like **weather stripping, pipe and wall plate insulation**. Which would be useful in your home and where would you use them?
4. What are some of the benefits the Prairie South School Division achieved by putting new windows and lighting in these Moose Jaw **heritage schools**?
5. **Real Retrofit:** The 2018 Energy Retrofits of the **1970s Split-Level** home will reduce the home's energy use by about 40% or 70GJ/year. Calculate the reduction in greenhouse gas emissions from making this retrofit to the home. Use this calculation:

$$70\text{GJ/year} \times 50\text{kgCO}_2/\text{GJ} = \underline{\hspace{2cm}} \text{kgCO}_2/\text{year reduction.}$$





Smarter Science Better Buildings

WDM North Battleford Exhibits Tour Guiding Questions – Pages 7 - 16

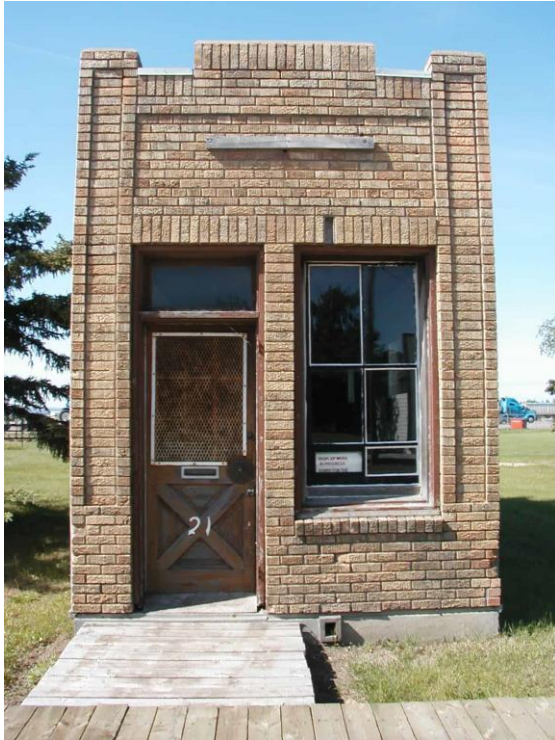
Explore Jakob Marjan's Shoe Repair Shop, the Hamelin Family House and the Grey Schoolhouse as well as the *100 Years of Saskatchewan History* exhibit. Use the map on page 16 to locate the buildings and exhibits.

With your classmates, you will work your way through the Museum exhibits, answering the questions provided and discussing what you see. You will explore three Museum exhibit buildings. Think about where air would leak into the buildings and where heat would be lost. Compare the exhibit buildings to each other. What factors make some of the buildings more energy efficient than others? What factors make modern buildings either more or less energy efficient than these buildings?





Move To Jakob Marjan's Shoe Repair Shop



This brick building was the business of Jakob Marjan. Jakob was a shoemaker who immigrated to Saskatchewan from Europe. In 1931, he had this little building built so he could run a shoe repair shop. His business was open on Railway Avenue in North Battleford for 37 years. Both Jakob and his wife, Leokadia, were very active in the community. Jakob's family still lives in North Battleford.

In 1991, the WDM saved Jakob's brick shoe repair shop from demolition and made it part of the Heritage Farm and Village.

Saskatchewan has a long history with brick as a building material. The Claybank Brick Plant in southern Saskatchewan, manufactured bricks made from clay found onsite from 1914 - 89. These bricks were used in the construction of several well-known buildings, including the Bessborough Hotel in Saskatoon and on NASA's rocket launch pads at Cape Canaveral in Florida.

Examine the building as you read the questions below.

1. Estimate the thickness of the walls in cm: _____
2. Where could heat escape from this building?
 1. _____
 2. _____
 3. _____
 4. _____
3. How many windows does the brick shop have? _____





4. Think about the thickness of brick when compared with the thickness of wood. Do you think a building made of brick keeps the building warm better or worse than a building made of wood? Why or why not?

5. As a business, the door of Jakob's shop would have been frequently opening and closing. How would this impact energy efficiency when compared with a home?

6. Compared with many businesses today, Jakob's shop is very small. If we are trying to conserve energy, what are some helpful things about a smaller building?





Move to the Hamelin Family House



This is the home of Dr. Joseph Jules Hamelin, one of the first doctors to practice in North Battleford. He arrived in 1911 when the town was booming. North Battleford had many amenities, including electricity and running water. Dr. Hamelin built this house on 99th Street. In 1970, this house was donated to the WDM and moved to the Heritage Village.

1. Estimate the thickness of the walls in cm: _____
2. Where could heat escape from this building?
 1. _____
 2. _____
 3. _____
 4. _____
3. How was this home heated? _____
4. How many panes of glass are in the windows? _____
5. What are possible light sources for this building (name as many as you can think of)?





Compare the Hamelin Family House and Jakob Marjan's Shoe Repair Shop

Let's compare Jakob Marjan's Shoe Repair Shop and the Hamelin Family House now that we have looked at both buildings in the Heritage Farm and Village.

Which building is more energy efficient? Think about the size of the buildings, thickness of the walls, number and size of windows, type of heat, etc. Explain your choice.





Move to the Grey Schoolhouse



This school is known as Grey School. It was moved to the WDM from the Maymont area. The school opened in 1909 with 21 students. This was called a 'one room schoolhouse' as all of the grades were in the same room. The school was also used by the local community as a meeting place and as an entertainment centre.

The school stayed open year-round and only closed because of blizzards and illness. For example, the school was closed in 1916 for two weeks because of a measles outbreak and again for six weeks in 1918 due to the Spanish Flu Pandemic. The school building was donated to the WDM in 1965.

1. List the materials that were used to build this school. Where would local builders get these materials?

2. Estimate the thickness of the walls in cm: _____

3. Where could heat escape from this building?

4. How was this building heated? _____





5. What provided light for this building? _____
6. How many windows are in the Schoolhouse? _____
7. How many panes of glass are in each window? _____
8. List three things in this Schoolhouse that did not use electricity in the 1920s but might need electricity in your classroom today.
 1. _____
 2. _____
 3. _____

Compare the Grey Schoolhouse with your School

The Museum’s schoolhouse was built in the 1920s. Let’s compare it with your school building today.

Which building is more energy efficient? Think about the size of the schools, thickness of the walls, number and size of windows, type of heat, etc. Explain your choice.





Move to the *100 Years of Saskatchewan History* Exhibit



Western Development Museum



Western Development Museum

Traditionally, nomadic Indigenous groups used easily transportable tipis or tents. Tipis were constructed, owned and set up by women. Women erected the tipis by constructing a framework of 15 - 17 wooden poles upon which a covering of 12 - 20 hides, usually bison, was overlaid and held in place using pegs. Smoke flaps near the top allowed for smoke to escape from the fire that was built within for cooking and heat. The tipi was waterproof, windproof, warm in winter and cool in summer, and portable - all important attributes to support a nomadic lifestyle in a changing climate.

Imagine you are standing in a real tipi.

1. Why do you think tipis were warm in the winter?

2. Which home do you think would be more comfortable in the winter – a tipi covered in bison hides or a wooden house? Explain your choice.





Natural Resources

Near the tipi is an exhibit about natural resources in Saskatchewan.

Few places have been blessed with the richness of natural resources that Saskatchewan enjoys. Beneath our feet are natural resources such as coal, oil and natural gas. For many years we have used these natural resources to heat our homes. These natural resources are called non-renewable resources meaning that we cannot replenish them once they are gone. Solar and wind power are called renewable resources. In Saskatchewan we are starting to use more renewable resources. For example, the visitor centre at Fort Battleford has solar panels on the roof and a wind turbine to provide power to the building.



Enter the mine door when the light above the door is green. Make your way to the Coal display.

1. What is most of Saskatchewan's coal used for?

2. What are modern mine operators required to do after they have removed all the coal from the ground?



